shown in FIG. **18**, system **10** may include multi-layer holographic combiner **40** in housing portion **8**A (e.g., a first portion of housing **8** of FIG. **1**) whereas display module **20**A is located in a separate housing portion **8**B (e.g., a second portion of housing **8** of FIG. **1**). In practice, the position of housing portion **8**A may change relative to the position of housing portion **8**B over time. For example, housing portion **8**B may bend (e.g., around an axis parallel to the Y-axis of FIG. **18**) relative to housing portion **8**A (e.g., in scenarios where housing **8** of FIG. **1** is formed from a flexible material). In another example, housing portion **8**A may be coupled to housing portion **8**B by a hinge and housing portions **8**A and **8**B may rotate about the hinge such that the relative angle between housing portion **8**A and housing portion **8**B may be non-uniform over time. In scenarios where system **10** is implemented as a head mounted device (e.g., a pair of glasses or goggles), housing portion **8**B may form a temple of a frame for the head mounted device whereas housing portion **8**A forms a bridge or other portion of the frame for the head mounted device. In this example, the arrangement of FIG. **18** illustrates only one side of the head mounted device (e.g., housing portion **8**B may form a left or right temple of the head mounted device). Similar structures may be used to project light to the user's other eye.

[0089] When the position of housing portion **8**B changes relative to the position of housing portion **8**A, display module **20**A moves relative to multi-layer holographic combiner **40**. If care is not taken, this may serve to distort the user's perspective when viewing images displayed by display module (projector) **20**A at eye box **24**. In order to mitigate these issues, multi-layer holographic combiner **40** may redirect a portion of the input light **56** from display module **20**A towards image sensor **228**, as shown by beam **224**. For example, transmission hologram structures **44** and/or reflection hologram structures **42** in multi-layer holographic combiner **40** may each include at least one hologram that diffracts input light **56** towards image sensor **228**. Image sensor **228** may include a camera or other image sensor components that gather image data in response to beam **224**. When the position of housing portion **8**A and multi-hologram holographic combiner **40** change relative to the position of housing portion **8**B and display module **20**A, distortions in the beam **55** redirected towards eye box **24** by combiner **40** will also be present in beam **224** provided towards image sensor **228**. The image data gathered by image sensor **228** may serve to identify these perspective distortions.

[0090] Control circuitry **16** may be mounted in housing portion **8**B or elsewhere in system **10**. Control circuitry **16** may be coupled to image sensor **228** over control path **232** and may be coupled to display module **20**A over control path **234**. Image sensor **228** may provide the captured image data to control circuitry **16** over control path **232**. Control circuitry **16** may identify distortions in beam **55** (as exhibited by beam **224**) and thus any relative motion between housing portion **8**A and housing portion **8**B using the image data. Control circuitry **16** may provide control signals to display module **20**A over control path **234** to control display module **20**A to compensate for these distortions. For example, control circuitry **16** may adjust the position and/or geometry of optical components within display module **20**A, may adjust the brightness/intensity of input light **56**, may adjust the color of input light **56**, and/or may perform any other desired adjustments to display module **20**A that compensate for distortions in beam **55** on account of the change in relative position between combiner **40** and display module **20**A.

[0091] In one suitable arrangement, a portion of the same input light **56** that is redirected towards eye box **24** is provided to image sensor **228** over beam **224**. In another suitable arrangement, display module **20**A may emit light at a dedicated wavelength such as infrared light as a part of input light **56**. One or more holograms in combiner **40** may redirect light at the dedicated wavelength towards image sensor **228** (e.g., without light at that wavelength being redirected towards eye box **24**). Image sensor **228** may be an infrared image sensor in this scenario.

[0092] If desired, an infrared projector **226** may be provided in system **10** (e.g., within housing portion **8**A, housing portion **8**B, or elsewhere). Infrared projector **226** may be coupled to control circuitry **16** over control path **230**. Control circuitry **16** may control infrared projector **226** to project infrared light **236** for directing towards eye box **24**. Infrared light **236** may be provided directly to eye box **24**, may be redirected towards eye box **24** by other optical components (not shown), and/or may be directed towards eye box **24** by one or more holograms in combiner **40** (e.g., reflection holograms in reflection hologram structures **42** and/or transmission holograms in transmission hologram structures **44**). Infrared light **236** may reflect off of the user's eye within eye box **24** (e.g., off of the user's retina or other physiological features). The reflected infrared light may be directed towards an infrared image sensor (e.g., image sensor **228** or a separate image sensor located within housing portion **8**A, housing portion **8**B, or elsewhere). The reflected infrared light may be provided to the infrared image sensor directly, by dedicated optical components (not shown), and/or by one or more holograms in combiner **40** (e.g., reflection holograms in reflection hologram structures **42** and/or transmission holograms in transmission hologram structures **44**).

[0093] The infrared image sensor may generate gaze (eye) tracking data in response to the reflected infrared light that is indicative of the direction in which the user is gazing into eye box **24**. Control circuitry **16** may process the gaze tracking data to track the direction of the user's gaze over time. Control circuitry **16** may adjust the image data projected by display module **20**A, adjust the physical properties of input light **56**, and/or may perform any other desired operations based on how the user's gaze changes over time. In another suitable arrangement, infrared light emitted by display module **20**A may be used to perform gaze tracking operations. This example is merely illustrative and, if desired, infrared projector **226** and gaze tracking functionality may be omitted.

[0094] FIG. **19** is a flow chart of illustrative steps that may be processed by system **10** in performing feedback operations on display module **20**A to compensate for changes in the position of display module **20**A relative to multi-layer holographic combiner **40** over time (e.g., to minimize distortions in light **55** provided to eye box **24**).

[0095] At step **250**, display module **20**A may project light **56** onto multi-layer holographic combiner **40**.

[0096] At step **252**, multi-layer holographic combiner **40** may replicate light **56** and focus the replicated light onto eye box **24**. At the same time, multi-layer holographic combiner